Title: Method And Apparatus For Collecting, Aggregating And Monitoring Network Management Information
Inventors: Rituraj Kirti, et al.
Date: February 13, 2002 Express Mail No. EL734779978US
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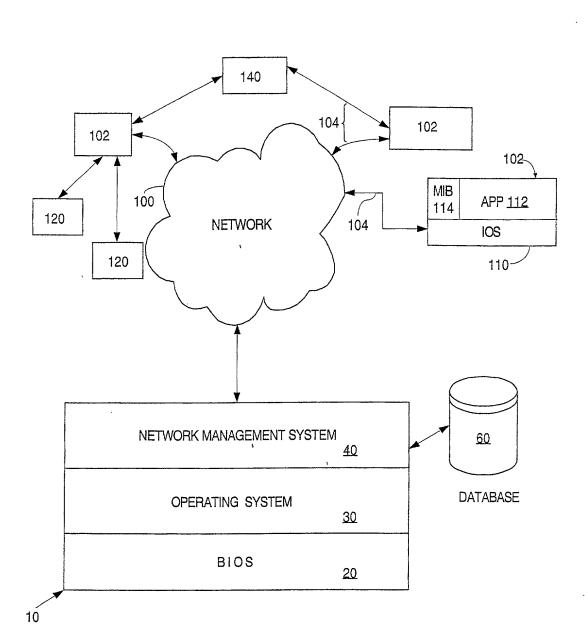


FIG. 1

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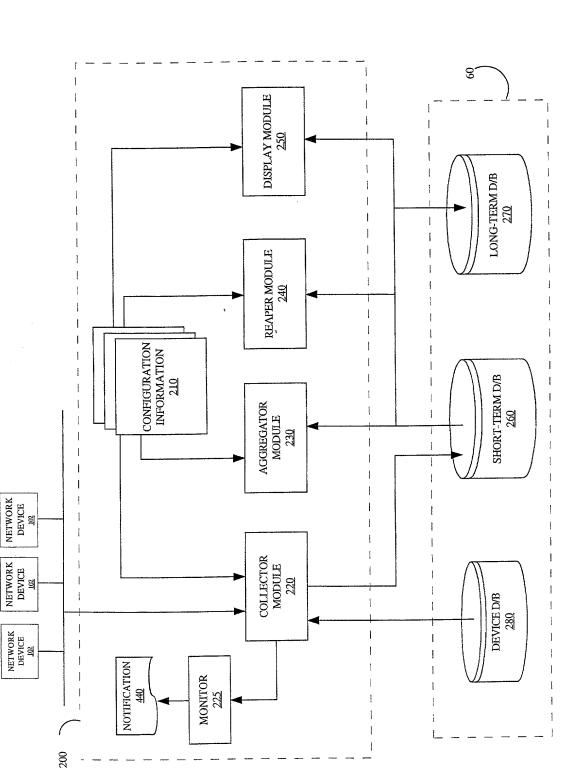


FIG. 2

Title: Method And Apparatus For Collecting, Aggregating And Monitoring Network Management Information
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XML CONFIGURATION PAGE

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	SCHEDULER SECTION <u>320</u>
	TARGET SECTION <u>330</u>
	OPERATION SECTION <u>340</u>
	STORAGE SECTION <u>350</u>
	THRESHOLD SECTION <u>360</u>
	AGGREGATION SECTION <u>370</u>
	TABLE TRIMMER SECTION <u>380</u>
	PRESENTATION SECTION <u>390</u>

FIG. 3A

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```
<!ELEMENT Collector (Schedule, InputBlock) >
<!ELEMENT Schedule (Poll?) >
<!ELEMENT Poll (EMPTY) >
<!ELEMENT InputBlock (QueryBlock) >
<!ELEMENT QueryBlock (Query, ForEachRow) >
<!ELEMENT Query (ModelQuery | SnmpQuerySet) >
<!ELEMENT ModelQuery (#PCDATA) >
<!ELEMENT SnmpQuerySet (SnmpQuery+) >
<!ELEMENT SnmpQuery (SnmpVariable+) >
<!ELEMENT SnmpVariable (EMPTY) >
<!ELEMENT ForEachRow (QueryBlock | OutputBlock) >
<!ELEMENT OutputBlock (Column*, Threshold*) >
<!ELEMENT Column (Formula) >
<!ELEMENT Formula (SimpleFormula | ArithmeticFormula) >
<!ELEMENT SimpleFormula (EMPTY) >
<!ELEMENT ArithmeticFormula (#PCDATA) >
<!ELEMENT Threshold (ArithmeticFormula, Notification) >
<!ELEMENT Notification (#PCDATA) >
<!ATTLIST Collector name CDATA #REQUIRED >
<!ATTLIST Collector version CDATA #REQUIRED >
<!ATTLIST Poll frequency CDATA #REQUIRED >
<!ATTLIST SnmpQuery ipVariable CDATA #REQUIRED >
<!ATTLIST SnmpQuery operation (GET|GETTABLE) #REQUIRED >
<!ATTLIST SnmpQuery instance CDATA #REQUIRED >
<!ATTLIST SnmpVariable name CDATA #REQUIRED >
<!ATTLIST SnmpVariable oid CDATA #REQUIRED >
<!ATTLIST SnmpVariable type
 (OID | INT32 | UINT32 | TIMETICKS | COUNTER32 | COUNTER64 | GAUGE32 | IPADDR
ESS OCTETSTRING) #REQUIRED >
<!ATTLIST Column name CDATA #REQUIRED >
 <!ATTLIST Column description CDATA #IMPLIED >
<!ATTLIST Column type (BOOL | INT8 | INT32 | INT64 | STRING |
 FLOAT | DOUBLE ) #REQUIRED >
 <!ATTLIST Column size CDATA #IMPLIED >
 <!ATTLIST Column isKey (YES|NO) "NO" >
 <!ATTLIST SimpleFormula variableName CDATA #REQUIRED >
```

FIG 3B

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```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
     <!DOCTYPE Collector SYSTEM "CscoHsaCollectorConfig.dtd" >
     <Collector name="Router Host Information" version="1.0">
         <Schedule>
              <Poll frequency="60000" />
 321
         </Schedule>
         <InputBlock>
              <QueryBlock>
                  <Query>
                    <ModelQuery>select Name, SysName, ProductType,
 331.
     ManagementIPAddress from Cisco_ManagedNetworkElement where
     ProductFamily="Router"</ModelQuery>
                  </Query>
                  <ForEachRow>
                      <QueryBlock>
                           <Query>
                              <SnmpQuerySet>
                                 <SnmpQuery ipVariable="ManagementIPAddress"</pre>
 332
                      instance="0" >
     operation="GET"
                                    <SnmpVariable name="SysUpTime"</pre>
     oid="sysUpTime" type="TIMETICKS" />
                                    <SnmpVariable name="CPU1Minute"</pre>
341
     oid="avgBusy1" type="INT32" />
                                    <SnmpVariable name="CPU5Minute"</pre>
     oid="avgBusy5" type="INT32" />
                                </SnmpQuery>
                            </SnmpQuerySet>
                        </Query>
                   <ForEachRow>
                      <OutputBlock>
                             <Column name="DeviceDbId" type="INT32" isKey="YES"
                                <Formula>
                                     <SimpleFormula name="Name" />
                                </Formula>
351
                             </Column>
                             <Column name="HostName" type="STRING" size="1024">
                                <Formula>
                                  <SimpleFormula name="SysName" />
                                </Formula>
                            </Column>
                            <Column name="IPAddress" type="STRING" size="15" >
                               <Formula>
```

FIG 3C

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</QueryBlock>
</InputBlock>
</Collector>

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```
<SimpleFormula name="ManagementIPAddress" />
                              </Formula>
                           </Column>
                           <Column name="ProductType" type="STRING" size="256"
                              <Formula>
                                <SimpleFormula name="ProductType" />
                              </Formula>
                             </Column>
                             <Column name="SysUpTime" type="INT64" >
                               <Formula>
                                   <SimpleFormula name="SysUpTime" />
351
                               </Formula>
                              </Column>
                               <Column name="CPU1Minute" type="INT32" >
                                 <Formula>
                                   <SimpleFormula name="CPU1Minute" />
                                </Formula>
                               </Column>
                               <Column name="CPU5Minute" type="INT32" >
                                  <Formula>
                                    <SimpleFormula name="CPU5Minute" />
                                  </Formula>
                                  </Column>
                             <Threshold>
                                    <ArithmeticFormula>CPU5Minute &gt;= 90
361
      & CPU5Minute.Previous < 90</ArithmeticFormula>
                                     <Notification>Router $HostName$ CPU
362
     utilization exceeded 90%</Notification>
                              </Threshold>
                         </OutputBlock>
                   </ForEachRow>
          </QueryBlock>
        </ForEachRow>
```

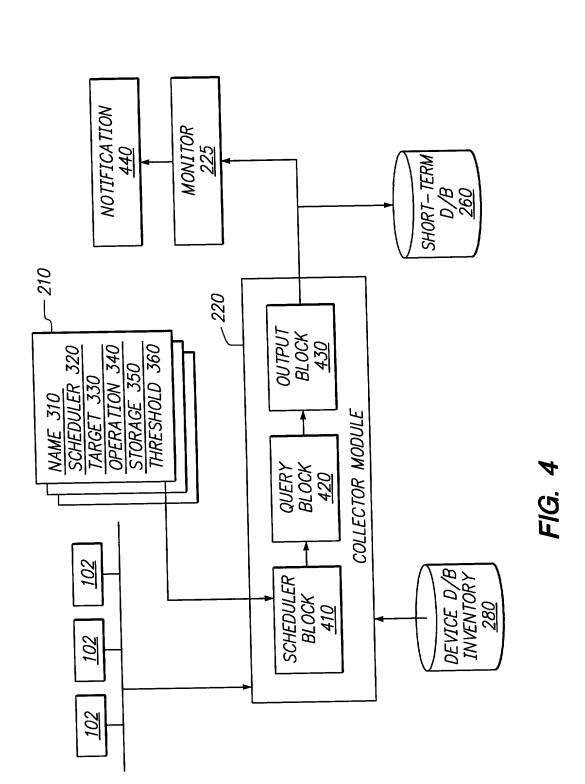
FIG 3C (continued)

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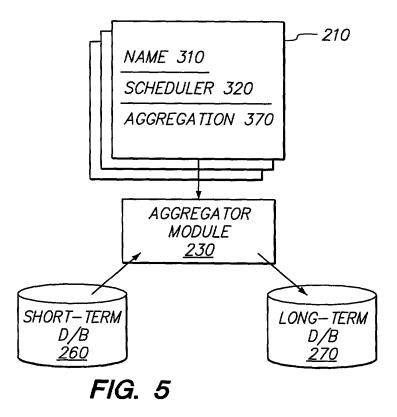
Title: Method And Apparatus For Collecting, Aggregating And Monitoring Network Management Information

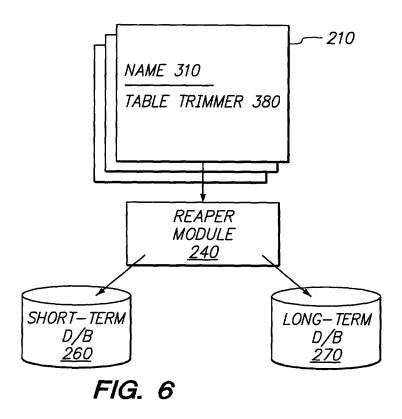
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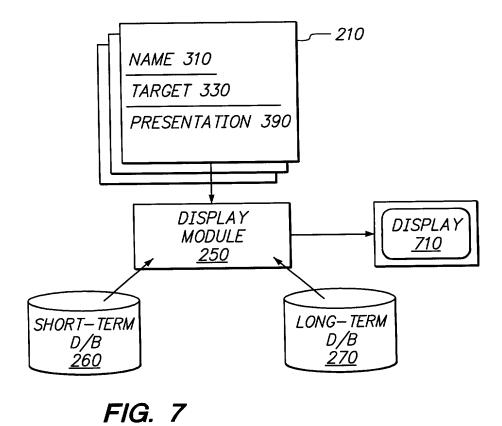


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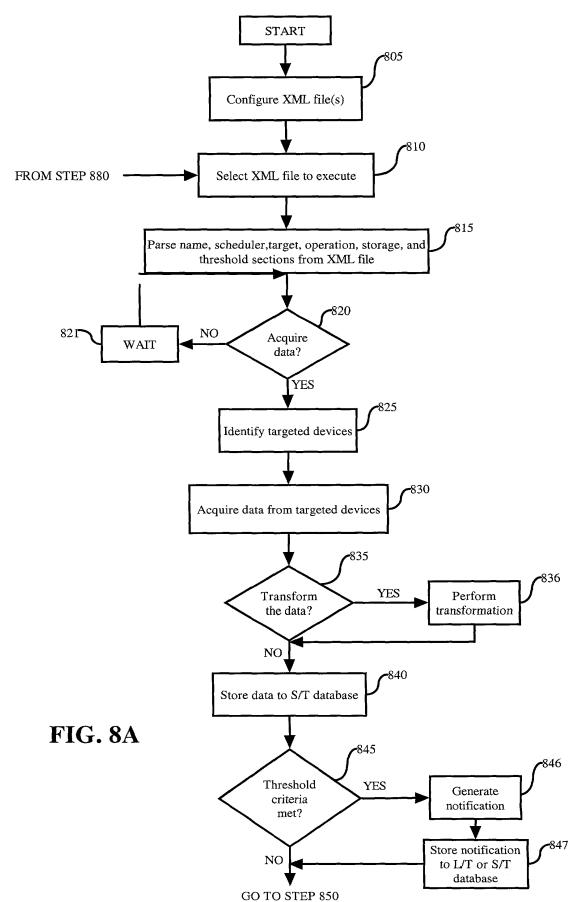
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Monitoring Network Management Information

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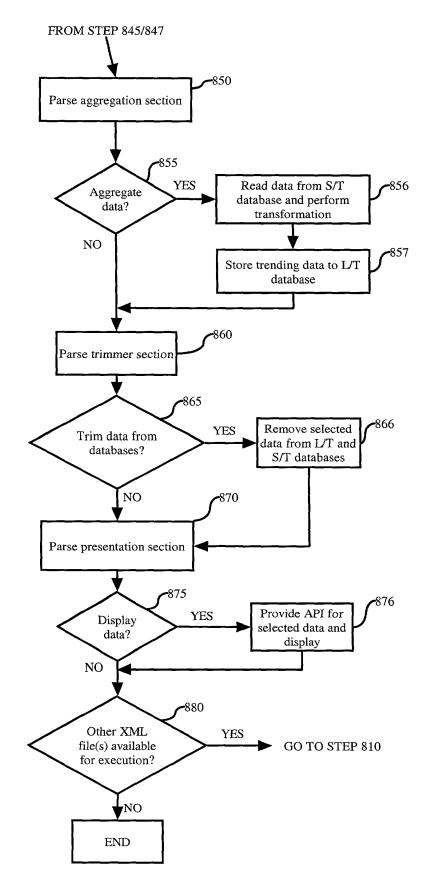


FIG. 8B

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